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FRONT COVER

A Cornfield in South Santa Fé, Argentina.

The yield from this field was expected to average 60 bushels per acre. (Photo by Guy Bush.)

BACK COVER

World Map—Distribution of Corn Production

The world annual production of corn during 1935–39 averaged 4,739,000,000 bushels, whereas the 1947 world crop amounted to 4,830,000,000 bushels.

NEWS NOTES

Dr. Moyer Aids in China Reconstruction Survey

Raymond T. Moyer, of the Technical Collaboration Branch, OFAR, left Washington early in June for China. He is a member of the Reconstruction Survey Group of the China Aid Program, United States Economic Cooperation Administration, whose responsibilities will relate to preliminary phases in the establishment of a joint Rural Reconstruction Commission and United States assistance in a Rural Reconstruction Program provided for in the China Aid Act of 1948 (P. L. 472). The group will also take preliminary steps in the interest of negotiating an agreement with China for a cooperative agricultural program in that country under the United States Information and Educational Exchange Act of 1948 (P. L. 402). The assignment covers a period of 2 or 3 months.

Cotton Specialist Makes South American Study

P. K. Norris, Agricultural Economist, of OFAR, left Washington early in June to make a study of cotton production and marketing in Brazil, Paraguay, and Argentina, under the Research and Marketing Act of 1946. His study will be from the viewpoint of competition with American cotton, particularly in export markets and will cover such factors as varieties, acreages now grown, and trends. He will return to this Office around October 1.

Specialist on Tree Nuts in Europe

Walter R. Schreiber, OFAR Specialist on tree nuts, is in the western Mediterranean area to study, under the Marketing and Research Act of 1946, the production of almonds, hazel nuts, and walnuts, particularly from the viewpoint of competition with United States edible tree nuts. After completing his study in Portugal, he went to Spain in June, and will continue his study in France, Switzerland, and Italy, returning to Washington the first of August.

Credit for photos is given as follows: P. 142, Diretoria de Publicidade Agrícola, Sec. da Agr., Indus. e Com., São Paulo, Brazil, supplied by Oscar Moore; p. 143, British Information Services; p. 155, F. G. Renner, Watershed Survey of Greece, SCS, USDA.

FOREIGN AGRICULTURE HALLY H. CONRAD, EDITOR

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Corn's Role In Feeding the Hungry

Gifts of Indian corn saved many early American colonists from starvation. Today the Americas are sharing these gifts, magnified manyfold, with the hungry peoples of the world.

by LEO J. SCHABEN

Directly or indirectly, corn has been an important item in the diet of the human race for several centuries, but never more so than today. Like the potato, peanut, tomato, lima bean, cacao, tobacco, and many other products now grown and consumed in large quantities in many parts of the world, corn is a native American plant whose existence was unknown to the rest of the world before the discovery of America. Today it is more widely distributed over the earth than any other crop grown by man.

The Spanish explorers, though greatly impressed by the size and appearance of the strange cereal, failed to appreciate its value. The first Europeans to recognize its importance were the English colonists along the Atlantic coast. They tried wheat, and it failed them; but when the existence of the Massachusetts and Jamestown settlements hung in the balance, during those first hard winters, it was corn that saved them.[1] There were several reasons for the popularity of corn in the colonial era: Seed was available from the Indians, corn furnished food for man and for animals, and it was the most adaptable and best yielding crop for newly cleared land.[2]

It is significant that the American Republics, where corn is the leading cereal crop grown, have never known a famine. Europe, Asia, and Africa, on the other hand, have often been ravaged by disastrous food shortages due to crop failures of the older cereals. Once again, following World War II, millions of men, women, and children in Europe, Asia, and Africa are suffering from hunger and the diseases that ravish the undernourished because of poor grain harvests. Once again, significant quantities of corn from the Americas have been utilized to supplement supplies of other cereals and foodstuffs moving to those areas from the United States, Canada, Argentina, and Australia.

[1] CORN INDUSTRY RESEARCH FOUNDATION. CORN IN INDUSTRY. 55 pp., illus. New York. 1937.

[2] BUECHEL, F. A. COMMERCE OF AGRICULTURE. 439 pp., illus. New York. 1926.

Corn as a Foodstuff

Although the industrial applications of corn are many and varied, and often amazing to the lay mind, the grain's greatest and most fundamental use is still the feeding of the human race. However, except in producing areas having a relatively low standard of living, or in years of famine, it is not important as an item for direct human consumption. This is true mainly because light or leavened bread cannot be made from it. Even in countries where considerable quantities are used for direct human consumption, the inhabitants would eat products made from wheat, rye, or rice in preference if sufficient quantities of those grains could be produced economically, or if the inhabitants could afford to purchase such products.

By far the largest part of the world's crop is converted into milk, cheese, butter, beef and veal, pork and lard, lamb and mutton, and poultry and eggs by the most efficient food factories known to man—dairy and beef cattle, hogs, sheep, and poultry. As a result, a large part of the world's corn crop never leaves the farm where it is grown, except in the forms indicated. Moreover, a large part of that which is sold off the farm is either fed to livestock in the large feeding centers of the world, or is converted into mixed and concentrated feed products, which are then returned to the farmer for feeding his livestock. In addition, a substantial part of the corn sold off the farms goes to the wet and dry millers, who convert it into such products for human consumption as starches, sugar, sirups, corn meal, corn flour, hominy grits, and breakfast foods.

While no more than small quantities, relative to the world's total production, are used directly for human consumption, there are, nevertheless, a surprisingly large number of countries where the cereal is thus used. Such is the case in virtually all the corn-producing areas in Asia and Africa, in Mexico and

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Central America. in many of the countries of South America, in several of the producing countries in southern and southeastern Europe, notably Rumania, and in rural areas throughout many of the Southern States in the Unitcd States.

During recent years of short food supplies and famine conditions in many parts of the world, the availability of large quantities of corn in such large producing countries as the United States and Argentina was a factor of great importance in preventing starvation in many famine-stricken countries, especially in Europe and the Far East. Virtually all the large quantities of corn exported from the United States during the past 3 years has been earmarked for direct consumption as human food. In many countries suffering from food shortages, large quantities of corn imported from overseas, thus far in this postwar era, have been mixed with other grains in the manufacture of bread flour in order to stretch available supplies of all grains as far as possible. Such direct use in the diet is of the greatest importance during years of short food supply, since a given quantity of corn, when used directly for human food, yields a much larger quantity of human food nutrients than when fed to livestock.

Climatic and Soil Requirements

Corn is unique among the cereals in that enormous differences exist among strains developed to meet the needs of diverse conditions of temperature, moisture, length of growing season, and other environmental factors. Each climate has its characteristic varieties. Some strains grow less than 2 feet tall and require no more than 60 to 70 days to mature. Others grow more than 20 feet tall and require from 300 to 340 days to mature.[3] In general, the most suitable climate for corn is found in the interior of continents where warm seasonal rains are ample and where both the summer nights and days are warm.

Reflecting its southern origin, corn is definitely a warm-weather crop that requires relatively high temperatures both day and night during the entire growing season. The region of greatest production in the United States has a mean summer temperature of 70° to 80° F., a mean night temperature exceeding 58° F., and a frost-free season of more than 140 days. In no country is corn cultivated for grain where the summer temperatures average less than 66° F., or where the summer-night temperatures fall below 55° F. Small grains replace corn in regions of the world with cool

[3] KULESHOV, N. H. WORLD'S DIVERSITY OF PHENOTYPES OF MAIZE. Amer. Soc. Agron. Jour. 25: 688–700, illus. 1933.

Corn is an important food crop in Colombia.

summers and short growing seasons, but the growing of corn for fodder may be of considerable importance in such regions.

Corn grows under a wide range of moisture conditions. Annual precipitation in the world's corn-producing areas varies from 10 inches in the semiarid plains of Russia to more than 200 inches in tropical Hindustan.[4] The exact amount of moisture required varies with the rate of seasonal evaporation, which, in turn, is influenced by prevailing temperature, humidity, and wind movement. But for optimum growth and maximum grain production, the plant requires not only a plentiful supply of moisture but a supply that is distributed throughout the growing season in accordance with the specific needs of the plant at its various stages of growth. In the United States Corn Belt, annual precipitation ranges between 25 and 50 inches, of which 7 inches, or more, fall during and after the silking and tasseling stage.

The fact that corn is so widely distributed throughout the world is fairly good evidence that the crop grows on a wide variety of soils. Soils, however, must be of a character that will retain sufficient soil moisture at the time it is most needed by the growing plant. Maximum yields are obtained in the areas of the world where the climate and grass vegetation have been responsible for the development of well-drained, fertile soils of favorable reaction and high in organic matter and exchangeable bases. Corn definitely requires an abundance of available plant nutrients, especially nitrates. It also requires a fair supply of phosphorus and potash. In addition, it is sensitive to conditions of deficient soil aeration. Of all the great soil groups, the Prairie soils are inherently the best suited for corn, since they fulfill the requirements most

[4] See reference cited in footnote 3.

An irrigated cornfield in Egypt.

completely and occur in regions having a climate especially favorable for corn.

Corn is a crop that is particularly well adapted to the use of mechanized agricultural equipment. The latter, of course, can be used to the best advantage only on relatively level land, unbroken by topographical barriers. A level topography is important also, because it helps to prevent destructive soil erosion.

Geographical Distribution of Corn Production

From a wild plant not even known today, the American Indians gradually developed types of corn that were adapted to climatic conditions in whatever parts of the continent the red men made their homes. As a result, its cultivation spread from its original home in Central America, or Peru,[5] over much of the Western Hemisphere. In the 456 years since the plant was discovered by Columbus, corn has been widely distributed throughout the agricultural regions of the earth. This would have been impossible had it not been for the previous existence in the Americas of the many widely divergent types developed by the Indians. In that accomplishment, the American Indian may be credited with the greatest plant-breeding job in all history.

As previously pointed out, no other cereal crop is distributed over so large a geographical area as corn, and only one other—wheat—occupies a larger acreage. However, corn is not grown anywhere in the Northern Hemisphere north of the fiftieth parallel, except for green fodder, or anywhere in the Southern Hemisphere south of the fortieth parallel. Within those geographical limits, production records are available for more than 100 countries or political units, ranging from Canada and the Soviet Union in the north to Australia and New Zealand in the south.

The world distribution of corn, based on average production for the 5-year period 1935–39, is shown on the map appearing on the back cover of this issue of FOREIGN AGRICULTURE. During that period an annual average of 220,000,000 acres of land was devoted to the crop, nearly half of it, 92,700,000 acres, in the United States. Of the total, the Northern Hemisphere accounted for 180,000,000 acres and the Southern for 40,000,000 acres.

The world's production in the same period averaged 4,739,000,000 bushels. Of that amount, approximately 50 percent, or 2,316,000,000 bushels, was produced in the United States. The average for the Northern Hemisphere was 3,965,000,000 bushels and for the Southern Hemisphere 774,000,000 bushels. The concentration of the major part of the world's corn acreage and production in the United States is especially noteworthy. The only other areas of concentration are those in north central Argentina, Italy, southeastern Europe, China, southeastern Brazil, southwestern Russia, northern India, the Netherlands East Indies, the Union of South Africa, and Mexico.

NORTH AMERICA.—North America is definitely the world's most important corn-producing region, accounting for more than approximately 47 percent of the world's 1935–39 acreage and 51 percent of the production. In recent years, however, this production percentage has increased with the marked expansion of acreage planted to hybrid varieties in the United States. The United States and Mexico are the only important producers in North America, but Guatemala, Cuba, Honduras, Nicaragua, and Canada also regularly appear in the record.

Very little of the United States crop is directly consumed as food, the bulk of it being fed to livestock on farms where it is converted into beef, pork, lamb and mutton, and dairy and poultry products. It has been estimated that fully 80 percent of the huge United States crop is fed to livestock. Industry—the wet millers, dry millers, mixed-feed manufacturers, and the distilling and fermenting industries—takes the remaining 20 percent. At least three-quarters of industry's share is processed into food and feed products. Thus, directly or indirectly, corn constitutes the principal source of food supply for the people of the United States.

In Mexico, the second most important corn-producing area in North America, virtually all the crop is used for corn bread ("tortillas"), which, together with

[5] MANGELSDORF, P. C., and REEVES, R. G. THE ORIGIN OF INDIAN CORN AND ITS RELATIVES. Texas Agr. Exper. Sta., Bul. No. 574, 315 pp., illus. 1939.

Brazilian youth shelling corn; the use of the small hand machine is typical of many farms in the State of São Paulo.

beans ("frijoles"), constitutes the staple diet of the Mexican people.

SOUTH AMERICA.—South America accounted for approximately 11 percent of the world's corn acreage and 12 percent of the world's production during the 5-year period 1935–39. Argentina and Brazil are the principal producers. In Argentina, which ranks second to the United States among the corn-producing countries of the world, the crop is destined mainly for the export market. For many years, Argentina has been the leading corn-exporting country in the world. There is relatively little domestic consumption either for livestock feed or for human food.

Because of the importance of quality and condition on arrival in foreign markets, Argentine producers have long shown a distinct preference for flint corn. Being exceedingly hard, flint corn does not absorb moisture to the same degree as do the softer dent varieties; and, after being dried out, it carries better to overseas markets. While experiments have shown that splendid harvests can be obtained from American dent corn, Argentine growers will probably continue to produce flint corn for export.

During 1935–39, Brazil was the fourth most important corn-produing country in the world. In most of the Brazilian States, corn is grown mainly for feeding livestock. However, in all of them a substantial part of the crop is used for direct human consumption. The country's corn acreage is widely distributed, but the major part of the crop is grown in the southern and southeastern area. Frequently, corn is planted between coffee trees and rows of cotton, especially in the States of São Paulo and Rio de Janeiro. The crop is also frequently interplanted with castor-beans, rice, peanuts, and beans. In the past 10 years, considerable attention has been devoted to growing corn for export. Any great expansion in production in the near future is precluded, however, by the lack of level expanses of suitable land and by competition for the use of the land by other crops.

EUROPE.—The distribution of corn production in Europe, which accounted for approximately 18 percent of the world's corn acreage and 18 percent of the production in 1935–39, serves to emphasize the high temperature requirements of the crop. Production is confined almost entirely to the southern portions of

the Continent, extending from Portugal and Spain through Italy, Greece, and the countries of the Danube Basin into the Black Sea area of southern Russia. By far the most important producing areas are in the Danube Basin, southern Russia, Italy, and Spain. Although these areas lie in a latitude about 5° farther north than the Corn Belt of the United States, they have, with the exception of Italy, very similar conditions of soil, temperature, and climate. In Italy, corn is grown mainly under irrigation.

In the Danube Basin, which usually accounts for more than 55 percent of the total European crop, the major part of the production is either fed to livestock or exported. However, direct consumption for human food is substantial, especially in Rumania, where corn has long been the chief foodstuff of the people.

In general, the lack of a sufficiently long growing season and unfavorable distribution of seasonal rainfall preclude the large-scale production of corn in the heavy livestock-feeding areas of northwestern Europe. The maintenance of the important meat and dairy industries of that part of Europe depends almost entirely on local production of root and forage crops supplemented by imports of corn, oats, barley, and oleaginous raw materials.

AFRICA.—Corn is an important item in the diet of virtually all African countries. During 1935–39, the continent of Africa accounted for slightly more than 8 percent of the world's corn acreage and about 6 percent of the production. The Union of South Africa, Egypt, French West Africa, and Angola are by far the most important producers, but corn is grown also in most of the other countries.

Roughly half the African crop is produced north of the Equator and half south. The Union of South Africa usually accounts for around 30 percent of the total crop, and Egypt, around 25 percent. In both countries it is the staple item of food in the diet of the natives and the peasants, although a substantial part of the crop in the Union of South Africa also moves into export channels. There are usually small exports from a number of other African countries, but in all areas corn is grown mainly as a foodstuff for direct human consumption.

ASIA AND OCEANIA.—Virtually all countries in Asia and Oceania produce corn, and the bulk of the crop, except in Australia and New Zealand, is grown for direct human consumption. The principal corn-producing countries of Asia, which accounted for about 16 percent of the world's 1935–39 acreage and 13 percent of the production, are China, India, Manchuria, and the Netherlands East Indies.

Agricultural Officer in charge of Moor Plantation, a large experimental farm and headquarters of the Nigerian Agriculture Department, in British West Africa, inspects a good crop of early corn. The work of the Plantation is directed toward the betterment of living conditions for the people of Nigeria and increased food production.

China is by far the most important Asiatic producing area. With an average crop during 1935–39 of

262,000,000 bushels, that country ranked as the third greatest corn-producing area in the world. With Manchuria's average production of approximately 87,000,000 bushels included, China's crop would rank second only to that of the United States. Corn is grown in a belt running in a southwestern direction all the way from south central Manchuria across the Yangtze River into the Provinces of South China. Although China, including Manchuria, has almost as many hogs as the United States, the production of corn, like that of virtually all other grains, is largely for direct human consumption.

India is the second most important Asiatic corn-producing area. Production is concentrated mainly in northern India on the alluvial lands of the Ganges Valley and the irrigated lands of the Punjab district. Although relatively unimportant in the agricultural economy of the country and occupying less than 3 percent of the total cultivated area, corn is nevertheless a staple item of food among the hill people of India. Since the end of the war, fairly large quantities have had to be imported by India because of the short supplies of other cereals and foodstuffs.

Java and Madura, in the Netherlands Indies, also produce substantial quantities of corn, most of it for direct use as a foodstuff. French Indochina produces much less of this grain than the Netherlands Indies but usually exports a substantially larger quantity. Corn is a crop of economic significance also in Turkey and the Philippine Islands. In both countries, the bulk of the crop is utilized directly for human food.

Very little corn is produced in Oceania, perhaps not more than 7,400,000 bushels annually, and virtually all of it is used for feeding livestock. About 95 percent of the total is grown in Australia and most of the balance in New Zealand. Production in such other areas of Oceania as the French Settlements, Fiji Islands, New Caledonia, and New Guinea is insignificant, but it serves as food for the natives.

Possibilities for Further Expansion

Further expansion in the world's production of corn will no doubt take place in areas that are climatically suitable for this grain, but it will be largely through the use of improved varieties and the adoption of better methods of production, rather than through any significant increase in acreage. In the United States, for example, where the corn acreage has declined since the early 1930's, production has been increased sharply through the use of hybrid varieties.

Corn already is being grown in a number of countries which do not possess climatic and soil conditions that are ideal for its cultivation. Further expansion in such areas is hardly to be expected. While the production of corn in other suitable areas may be intensified, the acreages available for corn in virtually all countries having such areas is at the present time quite well occupied either by corn or by other crops grown in direct competition with corn.[6] Possible exceptions may be found in undeveloped areas of Brazil and in limited sections of the humid portions of Africa.

Corn in International Trade

Only a small percentage of the world's corn crop enters channels of international trade as grain. During the 5-year period 1935–39, for example, when the world's crop averaged 4,739,000,000 bushels, world exports averaged 387,000,000 bushels, or about 8 percent of production. The main reason for this is that, with the exception of a few countries or areas, most of the crop is consumed locally as livestock feed or as human food on, or near, the farms where it is produced.

The bulk of the corn moving into international trade normally goes to the heavy livestock-feeding areas in Europe, principally the United Kingdom, the Netherlands, France, Belgium, Germany, and Denmark. Ordinarily, European countries other than Rumania, Yugoslavia, Bulgaria, and the Soviet Union are corn-deficit areas, although some—notably Italy, Spain, Greece, and Hungary—produce the greater part of their home requirements. All the others are significant net importers.

Normally, Argentina, with its corn belt immediately adjacent to ports of export, ships from two-thirds to three-fourths of its annual production, mainly to European markets for livestock feed. Exports during the 5-year period referred to above averaged 239,000,000 bushels annually, from an annual average production of 302,000,000 bushels.

The Danube Basin is normally the second most important export-surplus-producing area. During 1935–39, when the Danube Basin crop averaged 472,000,000 bushels, exports amounted to 40,000,000 bushels, or less than 9 percent of total production, and practically all went to European markets. More than 80 percent of the corn exported from the Danube Basin moves from Rumania and Yugoslavia. Exports from Russia are sporadic but in some years before World War II reached as high as 6,000,000 bushels. Virtually no corn has been exported from the Danube Basin, or from Russia, since the end of the war.

[6] KLAGES, K. H. ECOLOGICAL CROP GEOGRAPHY. 615 pp., illus. New York. 1942.

Favorable climatic conditions, vast level expanses, and a high degree of mechanization help to make the United States the world's leading corn-producing country.

Despite Asia's importance as a corn producer, its exports are relatively small. During 1935–39, when the total Asiatic production of corn averaged 608,000,000 bushels annually, exports averaged only 31,000,000 bushels, or 5.1 percent of production. Indochina, the Netherlands Indies, and Manchuria accounted for 4.9 percent of the Asiatic exports in this period. There were also small shipments from Burma and Turkey. Exports from Asia since the end of the war have been insignificant, being confined to small shipments from Turkey and Burma.

While corn is grown in virtually every country in Africa, exports are small. Of a total production during 1935–39, averaging 259,000,000 bushels annually, exports amounted to only 30,000,000 bushels, or less than 12 percent. The Union of South Africa in that period accounted for more than 50 percent of the exports. Nearly all African countries have been net importers of corn since the end of the war.

Normally, the United States is not considered an important source of supply for the corn moving into export-trade channels. This country shifted from its dominant position as an exporter of corn many years before World War I; Argentina then took the leading position and has held it ever since. At no time have exports of corn from the United States constituted more than a small part of the huge crop. At times, in fact, certain parts of the country have been on an import basis. The quantities involved, however, have never been substantial, except in years of very poor crops. Even in such years, imports are usually confined to coastal markets where grain from the Corn Belt may be relatively high in price.

Since the end of World War II, however, the United States has been an important source of supply for corn, exports having amounted to almost 32,000,000 bushels in 1945–46, 137,000,000 in 1946–47, and 12,000,000 during the first 7 months (October–April) of 1947–48. These shipments have aided greatly in easing the critical food situation abroad, especially in Europe and the Far East. The large exports from the United States in these postwar periods resulted partly from low supplies in the Argentine, partly from the disappearance of the Danube Basin as a source of supply, and partly as a result of the general shortage of foodstuffs in foreign countries since the end of the war.

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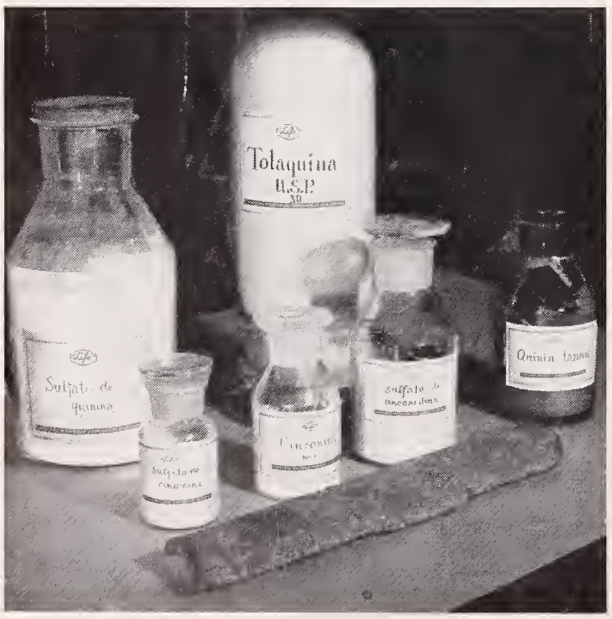
Better Health Through Agricultural Collaboration

by QUINCY EWING

The recent sessions in Washington of the Fourth International Congresses on Tropical Medicine and Malaria served to emphasize the close interrelation between the advancement of sanitation and control of diseases and the advancement of agriculture in any area. Health and agricultural progress contribute to each other.

There can, of course, be little agricultural progress when rural people are not reasonably healthy and well nourished, and when insects, parasites, and other possible disease carriers are not brought under control. Thus health and sanitation—for people as well as for crops and livestock—are indispensable to the success of the program of technical agricultural collaboration between the United States and other countries. This is directed toward the social and economic betterment of the United States and the cooperating countries through agricultural research and application of technology.

The program has emphasized improvement of health conditions in the areas where the work is being carried on. Thus, methods are tested and demonstrated for wider application in the rural areas of the country concerned, which may be a necessary step to successful agricultural development.



The alkaloids shown in these bottles were processed from cinchona bark.

Also, the complementary crops, development of which is stressed in the collaborative program, include medicinal and insecticidal products important to programs of health and sanitation. An outstanding example is cinchona, source of quinine, which is used so widely in the fight against malaria. Of the diseases which commanded major attention at the sessions of the Fourth International Congresses, malaria has been a serious deterrent to development of many potentially important agricultural areas, particularly in warm countries.

In addition to quinine, cinchona also yields the alkaloids known as quinidine, cinchonidine, and cinchonine. When mixed with quinine and other extracts of cinchona bark, they constitute totaquina, a nonsynthetic product for treatment of malaria.

Important steps have been taken under the collaboration program to improve health conditions in certain tropical American areas where complementary-crop research is focused. Such activity has been particularly notable in the areas surrounding the cooperative agricultural station at Tingo María, Peru, where a winning battle has been fought against malaria.

Malaria was not considered endemic to the Tingo María area prior to 1945, but in that year an outbreak of the disease became so serious that it threatened to disrupt the work of that important center of complementary-crop development.

The U. S. Department of Agriculture assigned a specialist from the Office of Foreign Agricultural Relations to cooperate with Peruvian authorities in studying the problem. Together, they organized a practical and effective system for safeguarding the health of the station personnel and others in the area. DDT used systematically in dwellings, stables, and resting places of mosquitoes, in conjunction with field practices designed to eliminate mosquito-breeding areas, has reduced malaria at Tingo María during the

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past 2 years from an incidence of about 30 percent to practically none.

In El Salvador, the cooperative agricultural station, "Centro Nacional de Agronomía," has been cooperating with the Pan-American Sanitary Bureau and the Inter-American Cooperative Public Health Service in surveys to determine a more practical program of health and sanitation.

In Ecuador, a program of mosquito control was recommended at the Pichilingue station in the tropical western part of the country. Demonstrations were then conducted to teach local technicians to carry out the recommendations successfully.

The production of complementary crops other than cinchona, such as pyrethrum, rotenone, citronella, hellebore, sabadilla, nux vomica, and red squill, is encouraged under the collaboration program. They are providing greater supplies of medicinal and pesticidal products which contribute, directly and indirectly, to the health and strength of the Americas. Those used to combat germs and insects are helping to check the spread of human sickness and disease. Those employed against pests and diseases that attack plants and animals serve to increase production of food necessary for good health and nutrition.

World War II forcefully emphasized the necessity for developing greater production in the Western Hemisphere of these and other complementary crops. Many provide critical and strategic materials, and they sharply underscored the need, recognized even before the conflict, for technical cooperation among the Americas to increase their production in this hemisphere.

From this recognized need resulted the program of international collaboration in agriculture, authorized by the United States Congress in 1939 and implemented since 1942 through cooperative agricultural stations and collaborative research and extension projects in tropical America. The program is administered by the U. S. Department of Agriculture, through its Office of Foreign Agricultural Relations and the Bureau of Plant Industry, Soils, and Agricultural Engineering. The program is carried on in cooperation with the Department of State through the Interdepartmental Committee on Scientific and Cultural Cooperation.

Although the cinchona tree is a native of South America, most of the world's supply of quinine before World War II came from Java. Even before the Japanese overran that producing area, United States agricultural technologists began to stimulate cinchona production in the Western Hemisphere. In less than

Power sprayer for controlling disease is demonstrated at the Estación Experimental Agrícola de Tingo María, Peru.

3 years after the Far Eastern supply of the drug was cut off, the cinchona output in tropical America was sufficient to help materially the Allied reconquest of malaria-ridden areas in the Mediterranean and the South Pacific. At this time it seems unlikely that the Western Hemisphere will ever again be almost wholly dependent upon other parts of the world for quinine.

Extensive cinchona research and propagation are being conducted through the United States program of international collaboration in agriculture in Costa Rica, Ecuador, Guatemala, and Peru. The Department of Agriculture's contribution to the work has consisted chiefly of supplying technical equipment, distributing planting material, and assigning technicians to work on variety improvement, disease control, and propagation methods.

There has been more to cinchona research than merely planting in tropical America certain superior clonal strains developed in the Far East. Also involved is the adaptation of cultural methods to soil and climatic conditions. The best cinchona for commercial production in Guatemala, for instance, may not be that best suited for growth in other American countries.

The task, therefore, has been to develop specific clones suitable for production in the various growing areas. This has involved the utilization of all available stock, including the parent stock of the high-quinine-yielding bark of Java, known as *Cinchona officinalis*, var. *ledgeriana*, as well as species and varieties native to tropical America. There is continuous

When processed, pyrethrum flowers yield pyrethrins used in insecticides.

scientific effort to develop better stock and improved cultivation methods in nurseries and on plantations.

Pyrethrum and rotenone are two insecticide-producing crops of tropical America the production of which has been introduced, or improved, under the technical collaboration program. These have been particularly important in contributing directly to better health through insect control and to improved food supply, which is, in turn, fundamental to health.

World food shortages have emphasized the need for obtaining high food production per acre and preventing losses in storage and in transit. Surprising results have been obtained, especially in the Western Hemisphere, largely through improved technology, including the widespread use of pesticides.

Greater production of crops, meat, and dairy products has been achieved through control of plant and animal diseases and insects. In controlling insects, not only the widely known DDT but such insecticidal-plant products as pyrethrum and rotenone are important. Both are complementary-crop products of tropical America emphasized in the technical collaboration program. Red squill, another such product, has killed countless germ-laden, grain-destroying rats.

Pyrethrum has been famous for years as an effective ingredient of household and livestock sprays, dusting powders, and agricultural insecticides. The United States Armed Forces during World War II used it in large quantities to kill malarial and yellow-fever mosquitoes, as well as the flies, fleas, and lice that carry other diseases.

Pyrethrum is the product of a flower-bearing perennial, known as *Chrysanthemum cinerariaefolium*, grown in recent years chiefly in East Africa and Japan. After Pearl Harbor, increased production in the Western Hemisphere was necessary to replace Japanese supplies. As a result of the United States program in international collaboration in agriculture, pyrethrum culture in Peru has progressed from the experimental to the commercial stage. In Ecuador and Guatemala, cultivation likewise is proving successful, and acreage has expanded.

The rotenone output in the Western Hemisphere has substantially increased since World War II and has stopped imports from the Far East, which had been the principal source of the insecticidal product. This production rise has followed extensive work by scientists of the U. S. Department of Agriculture and cooperating American Republics in obtaining propagating materials of superior rotenone-yielding plants.

Early in the program, improved varieties of rotenone-yielding lonchocarpus were developed at the Department's experiment station at Mayaguez, Puerto Rico, and in South America. Since then the task of stimulating production of the better adapted and higher yielding varieties of these plant species has continued. As a result, substantial future supplies of rotenone in the Western Hemisphere are now assured.

Other medicinal drugs classed as complementary crops under the United States program of international collaboration in agriculture include menthol, belladonna, henbane, stramonium, digitalis, capsicum, aconite, ergot, and senna. All are important to human health, and all can be produced in the Western Hemisphere.

Reading about... Foreign Agriculture

The Market for United States Cotton in Western Europe in 1948, by P. K. Norris, Foreign Agr. Cir. FC 1–48, 14 pp. Issued by the Office of Foreign Agricultural Relations, Washington, D. C., June 2, 1948. This Circular is the second report, summarizing personal observations on the market outlook for various United States commodities, made by specialists who have studied, first hand, the possibilities in foreign markets under provisions of the Department's Research and Marketing Act. Mr. Norris discusses the situation in eight European areas—the United Kingdom, France, Italy, Switzerland, Belgium, the Netherlands, and the western zones of Austria and Germany.

Our Increasing Agricultural Trade With Cuba

by HAROLD L. KOELLER

During and since World War II trade between Cuba and the United States has increased markedly over prewar levels, both in value and physical volume. United States imports from Cuba rose rapidly during the war years, declined somewhat in 1945 and 1946, but reached during 1947 a new high in value of $510,000,000. On the other hand, American exports to Cuba, restricted by war allocations, rose slowly through 1945 and then increased sharply to new record levels in 1946 and 1947, reaching $486,000,000 last year. The value of our agricultural exports to Cuba in 1947 was about 10 times as great as before the war for a threefold increase in volume.

Sugar is by far the most important export from Cuba to the United States, followed by tobacco and molasses. These three agricultural commodities account for 80 to 90 percent of all United States imports from Cuba. Milled rice, wheat flour, and lard are the principal agricultural products that the United States sends to Cuba, but pork, fruit, vegetables, raw cotton, malt, and hops are all important. Although a little less than two-fifths of our total exports to Cuba were classed as agricultural in 1947, this proportion had increased from a prewar level of about 25 percent.

The United States usually imports more goods from Cuba than it exports to that country, which results in a favorable merchandise balance of trade for Cuba. With the rest of the world, Cuban trade was about in balance during the period 1935–39. Prior to World War II an unfavorable balance always occurred with Asia because of rice purchases there. Cuba also purchased more than it sold to European countries other than Great Britain, but for Europe as a whole it had a favorable balance. Since the war Cuba has had a favorable trade balance with nearly all countries. Rice was not obtainable from the Far East, and European countries (except Spain) were unable to supply goods that Cuba needed in prewar volume, but they had increased food requirements which they partially met by purchases from Cuba.

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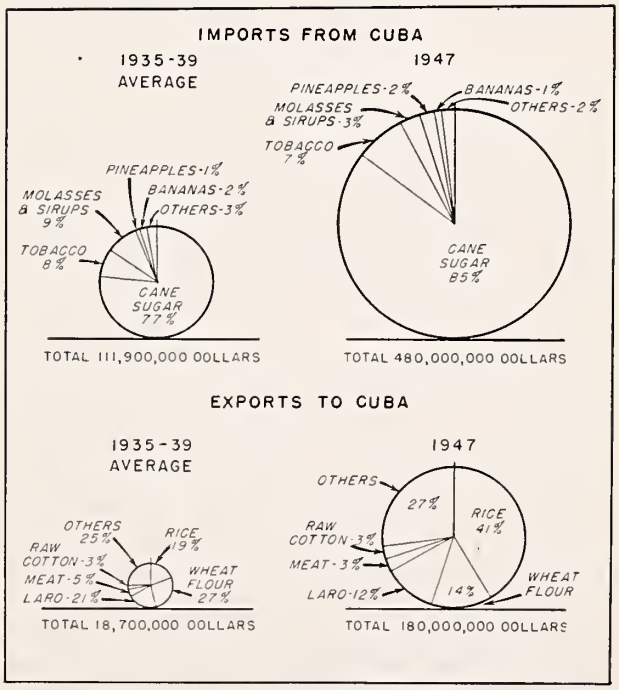
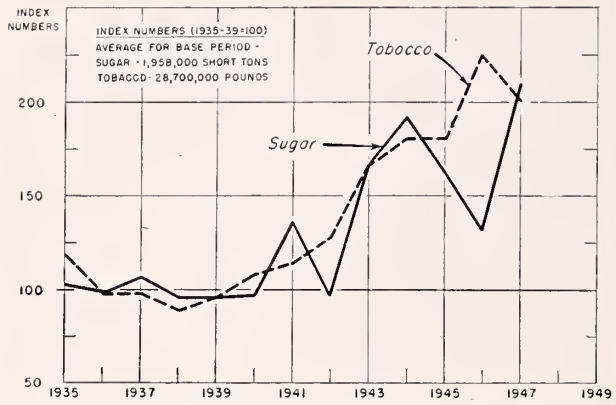
In addition to the favorable dollar balance resulting from large agricultural exports, Cuba also receives dollar income from the tourist trade, which amounted to an estimated $29,000,000 in 1946. Part of the dollar balance is absorbed by debt amortization and interest, as well as profits on American capital invested in Cuba, and by payments for ocean freight and insurance. For 6 years during the war and thereafter the United States purchased the entire exportable sugar crop and sent part of it to other countries under the lend-lease program and the occupation and relief programs. Cuba in this way has been accumulating a gold and dollar reserve of increasing proportions. In 1946 alone the increase in gold, silver, and foreign credits was equivalent to $120,000,000. The abundance of dollars and the inability to buy as many goods



United States agricultural trade with Cuba, 1935–39 average and 1947. Because of increases in both volume and prices, the value of trade in agricultural commodities in 1947 was many times that of the prewar period 1935–39. An increase in imports to about 4½ times the prewar level, together with Cuba's inability to obtain sufficient supplies in other areas, resulted in an increase in agricultural exports to nearly 10 times the 1935–39 figure.

as the Cubans wanted from the United States, owing to wartime restrictions and shortages, brought about considerable inflation accompanied by boom conditions in 1946, 1947, and 1948.



Indexes of quantity of sugar and quantity of unmanufactured tobacco imported by the United States from Cuba, annually during 1935–47. The United States requirement for Cuban sugar increased during the war years, mainly because the Philippine supply was cut off, and reached a high in 1947 with the end of rationing. Tobacco imports increased with wartime prosperity which made a greater demand for cigars at higher prices.

Agricultural Imports from Cuba

In 1947 over 90 percent of United States imports from Cuba were of agricultural commodities, and sugar alone accounted for over four-fifths of the total. Sugar has always been Cuba's leading export commodity. In fact, this crop is so important that the entire Cuban economy rises and falls with changes in the market for sugar. During the war Cuba, the only large producer of sugar for export to the Allied Nations, expanded production markedly in response to their requests. Prewar importation of around 2,000,000 short tons of Cuban sugar into the United States, with a value of about $85,000,000, increased during the war to well over 3,000,000 tons, valued at about $200,000,000 as supplies from other sources declined and those from the Philippine Islands were stopped. The Commodity Credit Corporation bought the entire sugar crop during the war years at negotiated prices. Since in the later years the price was tied to United States price levels by an escalator clause, there was a marked price rise in sugar after the removal of price controls in the United States. This inflated the dollar value of sugar imports, but, likewise, the value of United States exports to Cuba was increased by higher prices. In 1947 over $400,000,000 were paid by the United States for sugar imports of slightly over 4,000,000 tons.

The second most important agricultural commodity imported from Cuba is unmanufactured tobacco. In 1947, such imports amounted to over $35,000,000, although they had never exceeded $10,000,000 during the immediate prewar period. The quantity imported in 1947, 28,700,000 pounds, was just double the 1935–39 average. This tobacco is a cigar type, most of which is blended with United States tobacco, although about 1,000,000 pounds are used to make clear Havana cigars.

A byproduct of the sugar industry, blackstrap molasses, is another important Cuban export. This item (together with invert sirups) amounted to about $10,000,000 before the war, rose to $52,000,000 in 1944, but decreased to $15,000,000 in 1947.

Imports of bananas and pineapples vary in volume from year to year. Banana imports declined from 1938 to 1945, but in both 1946 and 1947 amounted to nearly $4,000,000 for about four-fifths the prewar quantity. Pineapple imports showed an irregular upward trend in value from 1935 to 1947. In 1947 they amounted to almost $8,000,000, including candied and preserved pineapples. Imports of fresh tomatoes have fluctuated widely from year to year but amounted to over $2,000,000 in 1947. A variety of other vegetables are imported in season.

TABLE 1.—*United States trade with Cuba, average 1935–39, annual 1940–47*

Year	All imports from Cuba	Agricultural commodities	Percentage agricultural	All exports to Cuba	Agricultural commodities	Percentage agricultural
	Million dollars	*Million dollars*	*Percent*	*Million dollars*	*Million dollars*	*Percent*
Average: 1935–39	118.9	111.9	94	74.6	18.7	25
Annual:						
1940	107.3	97.9	91	84.1	23.1	27
1941	171.1	156.3	91	124.6	36.1	29
1942	167.3	155.7	93	131.3	41.2	31
1943	283.6	208.3	73	131.6	48.4	37
1944	378.6	298.6	79	161.3	58.5	36
1945	[1] 337.6	[1] 265.6	79	[1] 188.9	[1] 71.3	38
1946	[1] 323.0	[1] 265.3	82	[1] 267.1	[1] 83.2	31
1947	[1] 509.5	[2] 480.0	94	[1] 485.6	[2] 180.0	37

[1] Preliminary.
[2] Estimated from preliminary data.

U. S. Department of Commerce, FOREIGN COMMERCE AND NAVIGATION OF THE UNITED STATES, and unpublished data.

Agricultural Exports to Cuba

In the prewar period 1935–39 the most important agricultural commodity exported to Cuba by the United States was wheat flour, followed by lard and rice. During the past 10 years, Cuba has come to depend on the United States for more of its rice requirements. Consequently, the exportation of

369,000 short tons of milled rice in 1947, worth nearly $75,000,000, made rice by far the leading item. Prewar exports averaged 62,000 short tons, worth $3,500,000. Wheat flour was second in 1947, valued at $25,000,000, or about five times the prewar value (for twice the quantity). Lard exports were also about double the prewar shipments and in 1947 were valued at nearly $22,000,000.

Meat products (principally hams, shoulders, and bacon), potatoes, fruit and vegetables (fresh, dried, and canned), and raw cotton were among the other important export items. Raw-cotton exports, however, never were of great value in relation to exports of cotton goods, although in 1947 raw-cotton shipments reached $5,000,000.

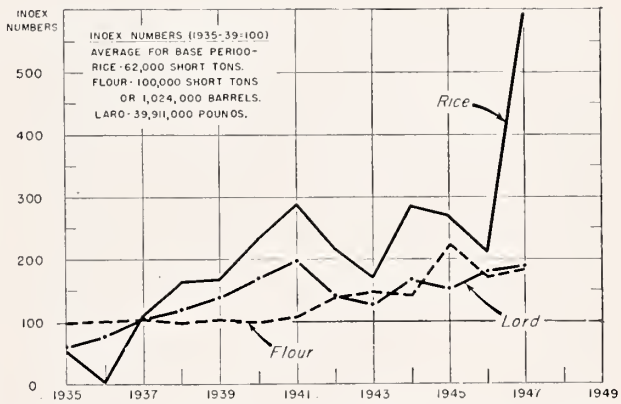
Trade Agreements

With the General Agreement on Tariffs and Trade signed at Geneva, October 30, 1947, the United States agreed to reduce its duty on sugar, tobacco, cigars, inedible molasses, and other commodities which Cuba exports. However, the volume of Cuban sugar imported by the United States is determined by the quota system and not by the tariff. Under the Sugar Act of 1948, a favorable quota allotment assures Cuba of a definite but variable share of the United States market for a 5-year period. United States domestic and insular producers and the Philippine Islands are given tonnage quotas, and Cuba is assigned 98.64 percent of the remaining United States sugar requirement as determined annually by the Secretary of Agriculture. Until the Philippine sugar industry recovers from the effects of the war, Cuba is allowed to make up most of the deficit.

In any case, however, the new law provides that Cuba's share of the United States market will be no less than under the Sugar Act of 1937, which permitted Cuba around 28.6 percent of the United States prewar market, amounting to about 2,000,000 tons annually. It seems probable that for the next few years the United States will take 2,500,000 tons or more. If financing in hard currency is provided for countries participating in the European Recovery Program, they may take another 1,400,000 tons. With other areas buying about 200,000 tons, a total of slightly more than 4,000,000 tons may be disposed of. The market thus provided will not be sufficient, however, to permit Cuba to continue to produce an annual crop anywhere near the size of the large 6,000,000-ton crops of 1947 and 1948.

In the General Agreement, Cuba agreed to a United States tariff quota on rice of 3,250,000 Spanish quintals, equivalent to approximately 165,000 short tons. This is equal to about 45 percent of the 1947 exports to Cuba but nearly three times the 1935–39 volume. It was agreed that the tariff quota would be increased by the amount necessary to supply the difference between estimated Cuban production and estimated consumption requirements. In the event that the Cuban Government decides to allocate the quota by countries, the allocation will be in proportion to the imports from each in the 10 calendar years immediately preceding the first year in which such allocation is made. Thus, the United States is assured a duty preference on the major part of Cuban rice purchases abroad.

Rates were reduced on wheat flour from the United States, whether made from domestic or imported wheat. Rates on wheat, onions, potatoes, fat pork, certain canned vegetables and fruits, canned soups, and other commodities were also lowered. The present favorable rate on lard was bound against increase, and raw cotton and wool were made duty-free.



Indexes of quantity of milled rice, wheat flour, and lard exported by the United States to Cuba, annually during 1935–47. Because of the difficulty in obtaining supplies from other countries, Cuba bought more of these commodities from the United States during and after the war. Rice exports in 1947 were exceptional, however, and not likely to be repeated.

Trends and Future Trade

Total trade with Cuba has been increasing since 1934, with the largest increase coming since 1942. The proportion of United States exports to Cuba represented by agricultural commodities has increased from 25 percent in 1935–39 to more than 35 percent since the war. (See table 1.)

The proportion of agricultural commodities in

United States imports from Cuba decreased from 94 percent before the war to less than 80 percent in the 3-year period 1943–45. This resulted from marked increases in imports of manufactured tobacco, manganese and chrome ores, candy, liquors and spirits, chemicals, and unset diamonds. The Cuban Government sought to assist local industries, but preliminary 1947 figures indicate a reduction in nonagricultural items as unusual wartime demands return to normal. Agricultural items are estimated to have amounted to about 94 percent of total imports in 1947.

During the war, restrictions on the exportation of meats, lard, and rice from the United States limited the amount of agricultural products Cuba could buy. As wartime controls were lifted, exports increased rapidly and far surpassed prewar levels. With the favorable price for sugar, the accumulation of dollar credits, and the resulting prosperity conditions, Cuba is in a position at present to consume larger quantities of imported foods than ever before. Cuba would probably take more rice, wheat flour, and meats this year if these were available in sufficient quantities.

As other parts of the world resume sugar production in about prewar quantities, Cuba may be unable to dispose profitably of its entire production, expanded to meet wartime needs. Many informed officials and businessmen foresee a fall in world sugar prices during the next several years. Should this occur, the Cuban Government probably would follow past practice and set a quota for each grower. This would be done for the purpose of obtaining a reasonable price on the world market by limiting the supply. Past experience shows that this will be effective only if other major producing and exporting nations similarly limit production.

At the same time, diversification of agricultural production, long fostered by the Government, would be given a new stimulus by lower returns from sugar. With reduced sugar income, the demand for imports from the United States would decline, but Cuba will continue to need rice, wheat flour, lard, vegetable oil, cured pork, and many other less important articles which Cuba cannot grow economically or in sufficient quantities.

The United States probably will continue to supply the major part of Cuban import requirements of agricultural commodities, and the proportion furnished by the United States may continue to be larger than in prewar years. However, the total volume of Cuban trade with the United States will depend largely on the price and quantity of sugar sold to the American market.

Reading about... Foreign Agriculture

Cartels or Competition, by George W. Stocking and Myron W. Watkins. 516 pp. The Twentieth Century Fund, New York, 1948. This book, which includes the report and recommendations of the Special Committee on Cartels and Monopoly appointed by the Twentieth Century Fund, is a discussion of the economics of international controls by business and government. It raises the fundamental question: "Can America maintain an economy based on free enterprise and competitive markets when most of its foreign customers and suppliers are state trading monopolies?"

The 12 chapter headings give some idea of its scope: The Decline of Competition, Growth of the Cartel Movement, Forms and Scope of the Cartel Movement, Economic Consequences of Cartels, Cartels as Instruments of Economic Control, Cartels and War-Born Maladjustments, Cartels and Economic Stability, Alternative Cartel Policies, The Problem of Raw Materials, National Interests: The Case of Britain, The Road Ahead, and A Cartel Policy for the United States (Report of the Committee on Cartels and Monopoly).

Since agricultural products play such an important part in the international trade not only of the United States but also of other major agricultural producers, this book holds much information of interest to readers of FOREIGN AGRICULTURE. Outstanding examples of cartels governing trade in products related to agriculture are the rubber, tea, and sugar controls, established by treaty, and the Chilean Nitrate, Dutch Quinine, and Japanese Camphor cartels, founded on unilateral governmental action. The development of these and many other monopolies or cartels is discussed by the authors of this timely publication.

Opportunities for Advanced Study in Latin America, by Sam Schulman. 49 pp. Inter-Americana Miscellanea, VII, School of Inter-American Affairs, University of New Mexico, Albuquerque. This mimeographed publication is a report of the Student Committee on Employment and Advanced Study to the Director of the School of Inter-American Affairs at the University of New Mexico. It summarizes "the results of several months of personal and written communication with individuals and organizations directly concerned with Latin American education."

Sheep—Man's Best Friend in Greece

by C. S. STEPHANIDES

From Biblical times sheep have made a great contribution to man in the way of food and clothing. This was especially true in the "old countries," where a man's wealth was measured by the number of sheep he had. Today in some Near Eastern countries sheep raising is the leading industry. In Greece, for example, sheep supply milk, milk products, and meat for food; wool for clothing and shelter; and skins for containers of cheese, wine, olive oil, and other liquids.

This branch of the livestock industry is well adapted to the topography and climatic conditions of Greece and contributes an important part of the total agricultural income. In 1937, the sheep industry accounted for 18.7 percent of the total income from livestock, whereas in value it represented more than 24.1 percent of the total livestock industry. In 1938, sheep supplied 46.6 percent of the total milk production and 47.2 percent of the meat production. Calculated on the basis of fat content, however, milk from sheep accounts for much more of the total milk output, since it tests from 6.0 to 7.5 percent fat.

Sheep are raised in Greece primarily for milk; meat and wool are of secondary importance. Lambs for meat are slaughtered when they are from 6 to 8 weeks old, and those that are kept for replacements are weaned very early so as to save as much milk as possible. Of the total income from sheep, nearly half is derived from milk and milk products, the breakdown on a percentage basis being as follows:

	Percent
Milk and milk products	45.10
Mutton	14.26
Lamb	24.77
Wool	8.68
Hides	7.19
Total	100.00

The greater part of the milk is used for cheese, more than 75 percent being used for soft white and the remainder for hard cheese. Of the total cheese and butter output in Greece from all kinds of milk, sheep account for about 68 percent of the soft cheese, 63 percent of the hard cheese, and 36 percent of the butter (table 1).

TABLE 1.—*Production of specified dairy products in Greece, by classes of livestock, average 1936–37*

Classes of livestock	Soft white cheese	Hard cheese	Butter
	Short tons	*Short tons*	*Short tons*
Cows	1,554	239	1,416
Water buffaloes	468	15	686
Sheep	36,578	9,075	2,014
Goats	14,930	5,111	1,402
Total	53,530	14,440	5,518

Production costs are much lower for sheep's than for cow's milk, because sheep seldom receive any feed other than that derived from pastures too poor for grazing by cows. Were it not for the cheap draft power provided by oxen and cows, the Greek farmers would probably confine themselves wholly to sheep raising.

The raising of sheep is carried on in four different ways in Greece, which are briefly described as follows: (1) Nomadic, traversing great distances; (2) semi-nomadic, moving within a comparatively small area; (3) settled in villages, but depending on pasture; and (4) stabled at home, and depending mainly on fodder, produced by owner or bought.

The nomads—Sarakatsanes, Vlachs, Karakounidou (Albanian Vlachs)—and a few natives follow the purely nomadic practices, similar to those of Biblical times. They have no permanent settlement but with their families and household equipment follow their flocks from pasture to pasture. Only in very rare cases, when weather conditions are too bad for the animals to graze, do they feed any concentrates.

Plato, Homer, and Aristotle described the life of the nomads of their time, and it does not differ from that of the nomads of today. In search of pasture for their flocks, they move toward the end of May to the mountains where they live all summer. In October they return to the plains where, owing to fall rains, the vegetation is green. They live mostly in tents that are made from the wool of their sheep, although

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This contribution was made possible by funds provided through the Office of the Coordinator, American Mission for Aid to Greece.

Sheep grazing near Trikhala.

they sometimes build temporary huts from brush or branches of trees. For centuries their mode of nomadic living has continued and has so established itself in the lives, customs, and habits of the people that it is hard to break it down.

In their simple day-to-day living, the nomad's needs are limited to a very few items, such as buttons, needles, thread, matches, salt, olive oil, and a few cooking utensils. Almost all their clothing and bedding are made at home from the wool of the sheep.

Every nomad has a few pack animals, such as horses and mules, which are used to transport his household effects, tents, children, and old women who are unable to travel afoot over the long, hard mountain trails. Illiteracy is high among these people. The women seldom know even how to sign their names, and the men rarely have a chance to complete the fourth grade of grammar school.

The families vary in number from 15 to 45, depending on composition and structure. The compound system prevails among them. The oldest member acts as the head of the group and handles all economic transactions and apportions the income, as well as the work, to the other members. They respect him and have great faith in his judgment and wisdom.

The second type of husbandmen, the seminomads, have permanent settlements, either on the plains or in the mountains. They follow their flocks to pasture but do not travel so far as the nomads and depend only in part upon grazing as feed for their sheep. Their families seldom travel with the flocks. They represent a transition stage from the nomadic to a semipastoral way of life.

The sheep enterprise carried on in settled villages—the third type of husbandry—marks an improvement over the nomadic and seminomadic types. In this, the people cultivate crops and raise draft animals. Some of the family devote their time to livestock raising and others attend to crops. Although their flocks depend largely on pasturage and on forest products, such as acorns, chestnuts, and leaves, they also receive additional feed—mostly grown on the farm.

Under the fourth, and most advanced, type of sheep husbandry the animals are stabled and are usually of improved strains. The products obtained from these sheep—wool, meat, and milk—are of better quality and in greater volume than those from the sheep raised under nomadic conditions. This type of husbandry is usually located in sections where fruit and vegetable growing is the chief agricultural enterprise, and the sheep are fed the byproducts of the gardens and orchards, as well as some concentrates.

The pasture area in Greece decreased from 1922 to 1937, during which period 1,500,000 refugees came into the country and had to be resettled on the land. During the same period, however, the sheep population increased from about 6,000,000 to 8,500,000. The small landowners, especially those in mountainous areas, had found that a small investment in sheep enabled them to make a better living. Sheep were preferred to other animals, because they contributed more to the family needs.

Despite the increasing numbers, the sheep population was still not large enough to meet the needs of the country for meat, and imports were necessary. In 1935, Greece imported almost 918,000 sheep. Cattle furnish a part of the meat supply, but numbers have always been relatively small, accounting for only about 24 percent of the domestic meat consumption.

Greek sheep, like those usually found elsewhere on the Balkan Peninsula, belong to the class having a narrow, long tail and wool mixed with hair. This class is thought to have originated from the trans-Caspian sheep of the steppes, *Ovis vignei*, introduced from Asia Minor. The different types in Greece today were originally of the Zackel class, according to Adametz, but have developed their present characteristics as the result of topography, climate, and care and management practices.

Variations in size, quality of wool, productiveness, color, etc., exist among Greek sheep, but there are certain general characteristics that apply to all in one degree or another. The small development of the skeleton; narrow body; short but strong legs, well-fitted for long journeys; the ability to feed on poor roughage, to withstand hardship; and early maturity are common features.

The different breeds are named after the regions in which they are raised. While not pronounced, the characteristics they have acquired in addition to the features common to all are distinct enough to distinguish one breed from another. The leading breeds are the sheep of Crete, Zakynthos, Lefkimi, Scopelos, Katafygion, Thrace, Serres, Karamanikon, Chios, Argos, and Metelini.

Of the 11 leading breeds, 7 are island sheep. They are quite different from the mainland sheep and produce many times as much milk, meat, and wool. These island breeds vary in number, according to the size of the islands. As a rule, the total per island is small, ranging from a few hundred to only a few thousand.

The isolation of the islands from the mainland and the uncertainty of feed supplies from the outside have contributed to the improvement of the island breeds. The island farmers are usually poor, and they cannot afford to keep many, or inferior, animals on their small holdings; thus, through centuries of intensive selection they have developed superior sheep, not only from the standpoint of milk, meat, and wool production but also from that of fertility. It is not unusual for these breeds to have twins and triplets. The bulk of their feed consists of byproducts from vegetable gardens and orchards, with some vetch hay and horsebeans.

Sheep improvement has been hampered in Greece by lack of organized breeding and inadequate Government control over the classification and establishment of pure breeds. Also, the pastures upon which the animals are so largely dependent for feed have not been improved since Homeric times. Continuous grazing and increased pressure of the livestock population on the same areas prevent the reseeding of legumes and grasses, and the pastures are near exhaustion.

Shelters for the sheep are usually crude and provide little protection from cold winds and winter rains. The crowding of the animals into open, muddy quarters encourages the spread of internal and external parasites, and estimates indicate that 10 percent of the sheep and goat populations are lost each year as a direct, or indirect, result of this practice.

Veterinary service is also inadequate. The Government takes special measures to combat disease only when the death rate reaches epidemic proportions. Neither individuals nor communities take any preventive steps against disease or parasites. Because of the common pasturing system, communal action is indispensable for effective control.

Greek peasant women spinning raw wool into coarse thread.

Yearly milk production varies among the different breeds of sheep from 20 to 250 quarts. This variation is attributed to differences in feeding habits, the origin of the animals, climate, topography, and care and management practices. Thus, possibilities are great for increasing the milk, meat, and wool production of the native breeds through selection, better feeding, improved shelters, and disease and parasite controls.

The sheep industry of Greece could not only become a greater source of income to the farmer and the nomad but could also add to the national income if certain measures that are within the means and the ability of the livestock people and of the Government were to be adopted, such as: (1) Improvement of breeds through selection, with better feeding and care; (2) rotational pasturing, fertilization, and in some cases reseeding of pastures; (3) construction of better shelters, suitable to local conditions; (4) the feeding of concentrates during winter months in order to maintain the health and vigor of the animals, which is always low after the lambing period as a result of inadequate feed; (5) eradication campaigns by community and state against disease and parasites to reduce yearly losses in animals and animal products; and (6) utilization of a small portion of the tax collected from livestock owners to improve breeds and better the health of the sheep and other livestock.

The Cashew Nut in Mozambique

by CURTIS C. JORDAN

Among the most prized seeds that the Portuguese navigators brought from South America to Africa and Asia was that of the cashew tree. This tree is not mentioned in the chronicles of Spanish discovery and conquest, which suggests that it did not exist north of the Amazonian parallel. It has been transplanted to Africa, Madagascar, Malaya, India, Indochina, and the Philippines.

The Brazilian name for the cashew nut was "acajaiba," which the Portuguese converted into "caju"; hence the French "acajou" and the English "cashew." The botanical name is *Anacardium occidentale*, a species of the family Anacardiaceae.

The cashew tree is handsome in appearance and dimensions, often reaching a height of 40 feet, with a spread of 60 feet. The root extends straight down, with a few lateral branches, giving the tree access to moisture during the dry seasons. The leaves are alternate, obtuse, ovate, and of a dark, metallic green; the flowers are red and scented.

There are two varieties of cashew—the yellow and the red—which are distinguished by the color of the pedical or stem of the fruit. The stems consist of a fleshy substance about the size and shape of a small bell pepper, from the lower end of which projects the fruit or nut. The tree blooms in August, and the fruit begins to form about October—earlier or later according to latitude and period of first rains. While the stem becomes gradually hypertrophied, the fruit or nut attains its full size almost immediately.

Cashew "apples" with nuts; the nut is the real fruit, but it is just one of the many valuable products derived from the cashew tree.

All parts of the cashew tree are of value. The leaves, when burnt or decomposed, form a good mulch or manure. The wood, which is light, close-grained, and beautiful, may be used for packing cases or even for building boats. The sap yields a resinous gum, similar to gum arabic, and the bark contains a high percentage of tannin. So far, these products of the cashew tree have not been commercially utilized in Mozambique. They are employed in a small way locally, mostly by the natives. The fleshy stem is the source of a refreshing beverage and of a type of varnish. The natives make an intoxicating liquor from the juice of the stem, the drinking of which is claimed to be the cause of considerable crime and idleness. Consequently, the local authorities have forbidden the natives to cultivate the tree.

Outwardly, the cashew fruit is a small kidney-shaped, ash-colored nut, as hard and tough as a dry hide. This nut consists of two parts—the outer shell and the inner almond kernel. The shell is divided into three layers—the outer, middle, and inner. The first and third are hard and dry, unfit for any use so far as known. The middle layer, on the other hand, is the richest part of the cashew shell, ranking next to the kernel in importance. A black, viscous, extremely pungent, blistering oil is extracted from this layer. This oil is put to various uses, such as coloring and preserving fish nets, immunizing wood and paper against termites, lubricating bearings, waterproofing textiles, and insulating electric equipment. It is also used in the manufacture of paints and varnishes on account of its anticorrosive qualities. The oil contains a phenolic compound called "cardol" (cashew-apple oil) and anacardic acid, with a minimum index of iodine of 296 (Wijs).

The cashew kernel is the richest of the tree's products from the industrial point of view. It has a mild and pleasant taste and ranks among the highest in nutritive value. There is a tremendous demand for it in the United States for use in confectionery and pastry and as a salted nut. Some attempts have been made to extract from the kernel the oil which forms 40 percent of its weight. This oil is edible and in some regions is used in the treatment of leprosy, warts, corns,

Mr. Jordan is United States Consul General assigned to Lourenço Marques, Mozambique.

ulcers, and as a substitute for iodine. It has an iodine index of 78/75 (Wijs).

About nine-tenths of the cashew trees in Mozambique are wild, and one-tenth are cultivated. The trees thrive in a coastal belt running from Lourenço Marques northward to Beira; then, after a short break, they extend from Quelimane north to the border of the Colony. In spite of the fact that the tree seems to bear as well in its natural wild state as when cultivated, organized plantations have increased in area during the past 25 years. The two principal plantation areas are in the district of Nampula and Porto Amelia (table 1).

The District of Nampula occupies first place, with nearly 86 percent of the area cultivated. Five "circumscriptions" have planted acreages exceeding 2,500 acres. Mossuril has 20,882; Antonio Enes, 9,397; Nacala, 3,583; Memba, 3,484; and Mogincual, 3,020 acres. The areas cultivated in the other districts are small, registering hardly more than 250 acres each. The figures given for planted areas may be deceptive, because some of the plantations were left uncultivated during the war years owing to the complete cutting off of the Indian market.

The cashew tree begins to bear in its third year, but the yield is not profitable until the fifth or sixth year. An adult tree yields an average of 22 to 44 pounds of nuts. The harvest from cultivated areas amounted in 1930 to little over 100 tons, compared with nearly 6,000 tons from uncultivated trees sold by the natives to local buyers for the export trade that year. The production of the plantations rose to 2,154 tons in 1942 but dropped to 1,729 tons in 1944. The total production of the Colony is estimated at 50,000 to 80,000 tons annually, most of which is left to waste for lack of a market. Exportation reached its peak in 1940, when 31,695 tons were exported, of which 28,680 tons were shipped to British India. Exports declined to 10,000 tons in 1942, to less than 1,000 in 1943, and to 6 tons in 1944.

The processing of the nuts for the market has never been developed in Mozambique because of the lack

TABLE 1.—*Area of cultivated cashew trees in Mozambique, specified years*

Year	Area in cultivation		
	District of Nampula	District of Porto Amelia	Total
	Acres	*Acres*	*Acres*
1929–30	1,787	72	2,305
1939–40	22,182	1,824	25,204
1941–42	30,771	5,374	37,611
1943–44	46,677	6,526	54,579

A grove of cashew trees.

of skilled, patient labor, such as is found in India. For that reason India has absorbed nearly all the cashew nuts exported from Mozambique. The separation of the kernel from the hull is a delicate, painstaking task which must be performed manually, and, as far as is known, no machinery has been devised which will successfully take the place of hand labor. During the war years, when the exportation of nuts fell off, an attempt was made to process the kernels by native labor. In 1943, 57 tons of kernels, valued at $13,960, were exported to the Union of South Africa, followed by 367 tons to the same country, valued at $56,400, in 1944. These values compare poorly with a prewar annual revenue of 20,000,000 escudos ($800,000).

According to a local daily, a Lourenço Marques electrician by the name of Luis Baldini Vissanju, after years of study, has invented a very complicated machine for shelling cashew nuts. The machine is said to turn out 22 shelled cashew nuts per second or about 10,000 nuts per 8-hour day, but it is yet to be perfected.

If this machine proves to be as efficient as the inventor claims it to be, a new and important industry may be established in the Colony.

HENEQUEN

Henequen is the Mexican name for the fiber-bearing plant of the genus *Agave fourcroydes*. The plant closely resembles maguey (*A. cantala*) and true sisal (*A. sisalana*). Its fiber together with that of sisal and abacá are the principal members of the hard-fiber category. Both henequen and true sisal are native to the Yucatán Peninsula of Mexico; henequen culture in Cuba is said to have started when suckers from Yucatán were brought to the island by one of the Spanish governors.

As recently as 1941, Mexico and Cuba were the major producers of henequen. Now it has become a major agricultural crop in El Salvador, and plantings have been made on one of the Government-owned farms in Guatemala. The 1948 crop in Yucatán has been estimated at about 132,000 short tons; Cuba's 1948 production is estimated at 15,500 tons, and that of El Salvador at 2,000 tons.

Henequen grows best in an arid climate with plenty of sunshine. Soils best suited to its cultivation are those having natural drainage. In Yucatán most plantations are on porous lime rock from which rain water drains quickly. In Cuba, rocky soil unfit for growing sugarcane is used for henequen. Suckers, about 18 inches high, trimmed of roots and outer leaves, are planted in holes dug into the rocky soil.

Cultivation is usually a matter of keeping down weeds and grass.

The henequen plant grows from a very short trunk which may attain a height of 6 feet during the lifetime of the plant. From a small rosette atop the trunk, grow the long gray swordlike leaves which reach a length of from 30 to 60 inches. Along the edges of the leaves, about 0.5 to 1 inch apart, grow small hooked prickles.

In Yucatán the first leaves are cut 6 or 7 years after the plants are set out. Cuttings may be made only once a year or once a month, but the practice on well-managed plantations is to make two cuttings a year. A yield of 25 leaves is considered a fair yearly average. When the pulp is removed from the leaves, the raw fiber that remains is in strands from 2 to 5 feet long and has a yellowish to nearly white color. Clean dry fiber ranges from 3.5 to 5 percent of the weight of the leaves. Principal use for henequen fiber is in the manufacture of binder twine, although substantial amounts were made into rope during, and shortly after, the war. Most of the henequen taken by the United States from Mexico is in the form of raw fiber, though imports of twine manufactured in Mexico have increased considerably in recent years, and imports of Mexican-made rope were substantial during the war.

INTERNATIONAL *Agricultural News*

Panama Honors Agricultural Engineer Rambo

Earl K. Rambo, Acting Chief of the United States Agricultural Mission to Panama, was awarded the Order of Vasco Núñez de Balboa in the grade of Commander on April 26, 1948. This award, the highest of the Panama Government for services to the Republic, was made in recognition of outstanding work in the field of agricultural engineering while Mr. Rambo was serving as an agricultural engineering adviser to Panama's Ministry of Agriculture and Commerce. The medal was presented by Sr. Guillermo Méndez, Minister of Agriculture in Panama.

A short time before Mr. Rambo had also received a medal from the National Fair Committee of Panama in connection with the national fair that was held in Panama last March.

A member of the Extension staff of the University of Arkansas, Mr. Rambo was employed during a year's leave of absence from the university by the Office of Foreign Agricultural Relations and loaned to Panama. He went to that country in June 1947 and has spent much time studying the farming practices of the interior and assisting farm-machine operators with their mechanical problems. He planned and organized several short courses covering the operation, care, and repair of farm machines owned by the Government in order to demonstrate that farm machinery could be efficiently used in Panama. He also assisted the Panama Department of Agriculture in mapping plans for experimental work with rice.

Mr. Rambo was appointed Acting Chief of the United States Agricultural Mission to Panama early this year. Other members of the Mission are Walton P. Sellers, Extension Specialist, and Marion M. Striker, Soil Scientist. They are continuing the work of the Mission in Panama, but Mr. Rambo returned to Washington in May and resumed his duties at the University of Arkansas shortly thereafter.

Inter-American Conference To Be Held in Denver

The Inter-American Conference on Conservation of Renewable Natural Resources will be held in Denver, Colo., September 7–20, 1948. This is the first international meeting of its kind on conservation. It is being held by the United States Government at the request of the Pan American Union, and invitations have been extended to the other 20 governments which are members of the Union.

The Conference, which is of a technical nature will have no power to negotiate agreements, but it is expected to recommend national and international action directed toward the conservation of renewal natural resources. Those participating in the conference will be classified as follows: Accredited representatives of the invited governments (chairmen, delegates, advisers, officers, and staff); invited specialists, technicians, and representatives of invited organizations; and the secretariat. The program is divided into six main sections: (1) Human Populations and Productive Capacity of the Land, (2) Renewable Resources and International Relations, (3) Land-Use and Social Sciences, (4) the Dynamics of Renewable Resources, (5) Education in Conservation Dynamics, and (6) Making Conservation Effective.

Soil Conservation Needed in Salvador

Henry G. Lewis, Soil Technician, has just returned to Washington from El Salvador where he has been for the past 11 months. While in El Salvador he was a member of the staff of the Cooperative Agricultural Experimental Station at Santa Tecla. He started a survey of the soil resources of El Salvador during the time when the field work was confined largely to the chain of volcanic peaks and valleys of the central portion of the country.

Some special areas were studied from the standpoint of erosion hazards, run-off, and flood control, as well as land use, suitability, and capability of other areas for agricultural use. Reports were prepared of such conditions.

A large variety of soil conditions are present in the country, and many parts have a serious erosion problem. Many steep, shallow, and badly eroded lands are still being cultivated owing largely to the increasing demands for food crops and the scarcity of good soils to take care of such demands. Because of the density of population, more intensive use of present areas or development of new lands on the coastal plains for crop production would seem to be necessary.

There is a definite need for a soil- and water-conservation program in the country, as well as an adjustment in land use and reforestation of several relatively large areas. Erosion has removed much of the topsoil layer in many parts of the country, and some soils are badly gullied or cut up by a complete or dendritic drainage pattern. Many of the dominant soils are low in fertility, organic matter, and nitrogen.

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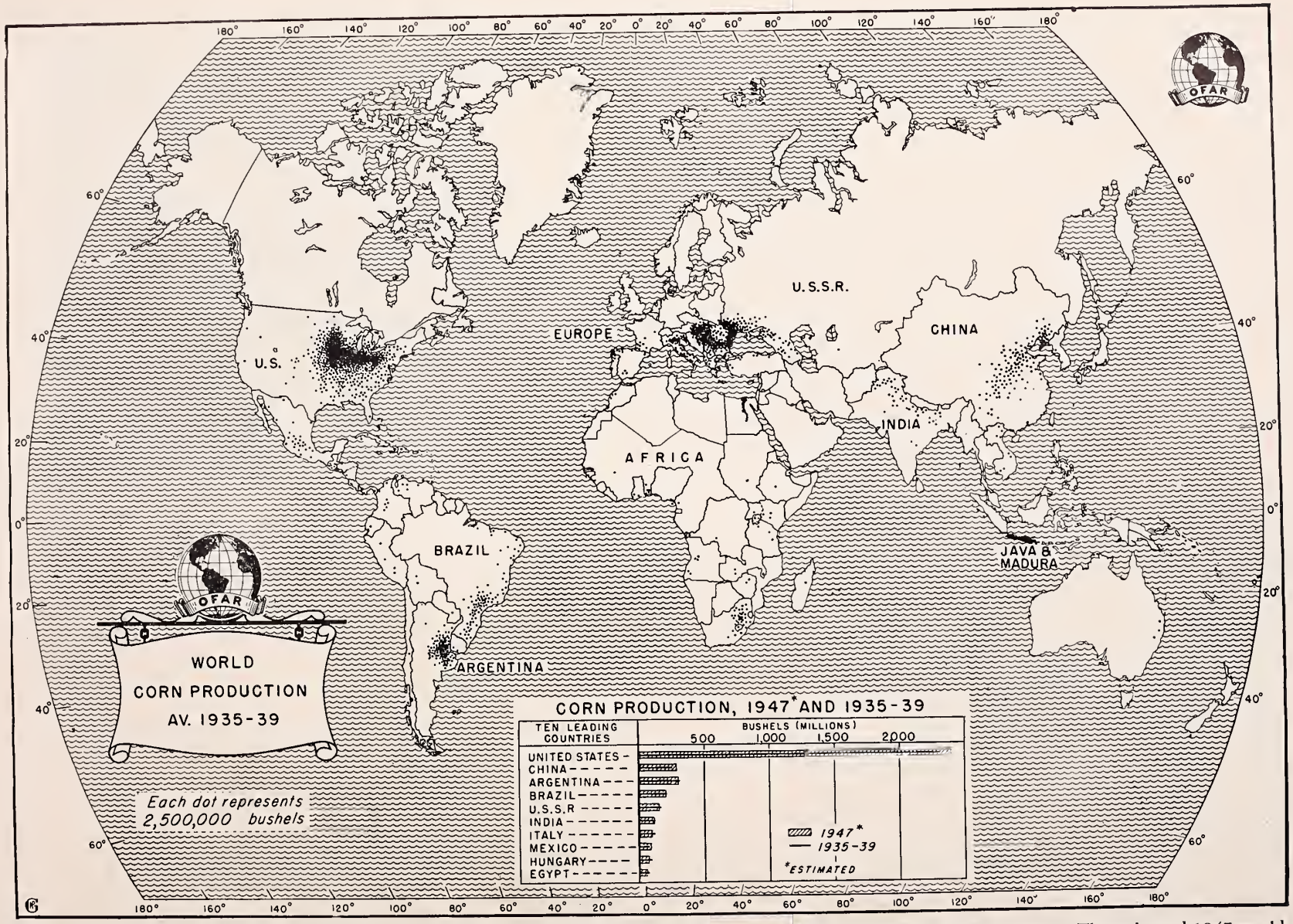

The distribution of the average annual world corn crop of 4,739,000,000 bushels for the period 1935–39 is shown on the dot map. The estimated 1947 world corn crop was about 4,830,000,000 bushels. This slight increase over the prewar period was due mainly to larger crops in the United States, China, and Mexico, as reflected in the inset bar chart. Most of the corn produced in the world is utilized for livestock feed or human food in the countries where grown.